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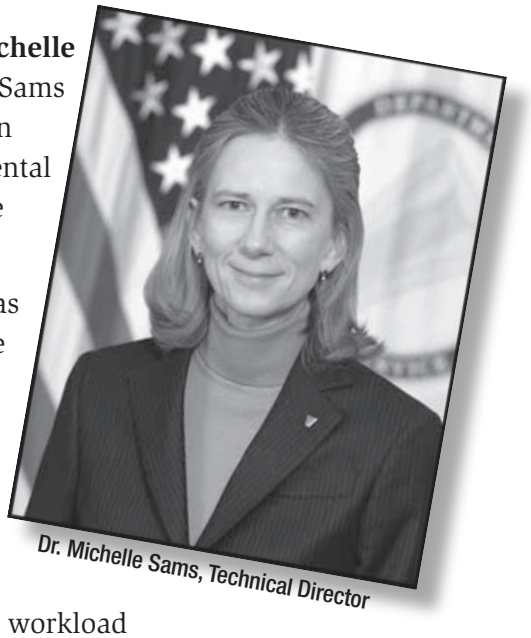
IN THIS ISSUE

Technical Director Arrives at ARI



Dr. Michelle Sams, Technical Director

ARI is pleased to announce **Dr. Michelle Sams** as its Technical Director. Dr. Sams received her B.S. in Biology, M.S. in Psychology, and Ph.D. in Experimental Psychology from New Mexico State University, Las Cruces, NM.

She began her professional career as an Engineering Psychologist for the U.S. Army Testing and Evaluation Command at White Sands Missile Range. In 1989, Dr. Sams joined ARI as a research psychologist conducting research in manpower, personnel, and training modeling and prediction; cognitive workload assessment; and computer-based foreign language training. Five years later, she moved into the ARI Plans, Programs, and Budget Office to serve in the Pentagon as the ARI liaison to the Deputy Assistant Secretary of the Army for Research and Technology, and to the HQDA Deputy Chief of Staff, G-1. In 1997, Dr. Sams left ARI for private industry to become a Program Manager and Principal Investigator for Teknowledge Corporation's Training Systems Group. This group conducted advanced technology research for various DoD agencies in the areas of intelligent tutoring and performance support systems, and natural language understanding for dialog-enabled agents. She has been a consultant for various training technology initiatives in the White House Office of Science and Technology Policy, Defense Advanced Research Projects Agency, Office of the Under Secretary of Defense for Personnel and Readiness, and the National Science Foundation.

Dr. Sams has published over 32 book chapters, journal articles, technical reports, and conference papers. She brings a wide variety of experience to the job. She also brings innovative ideas that will help us grow and prosper as an organization, more effectively accomplish our R&D mission, and provide products that help Soldiers and units remain trained and ready for current operations, and meet the future with confidence.

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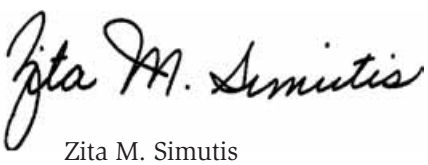
From the Director

ARI has a long history of conducting research to provide more effective training, such as its concept for MILES and introduction of AAR methodology. We have developed training strategies and performance metrics for a wide variety of technology platforms – from interactive video to distributed simulations. The four articles in this newsletter from our R&D projects reflect our continuing role to investigate issues critical to the successful design and employment of technology-based training.

Simulation advocates often equate training value with realistic visuals and entertaining play. These elements help to sell commercial games but are not necessarily sufficient to achieve training.

- The first article in this issue of our newsletter describes a symposium hosted by ARI to discuss how games and game-like simulations are currently being used for training in the military, to identify ways that games could be used more effectively, and to discuss what is needed in terms of research to ensure effectiveness.
- The second article describes an evaluation of a relatively low-fidelity simulation, the Rapid Decision Trainer. Results indicate that expensive, high-end graphics may not always be necessary to achieve training for certain types of tasks.
- The third article articulates a comprehensive concept for electronic Training Support Packages (e-TSP) embedded in operational systems and networks that are necessary for fielding Future Combat Systems. The critical functional concepts for e-TSP to be effective encompass automated diagnostic tools and selection criteria, easily modifiable exercises and scenarios, missing team member capabilities, reachback to SMEs, and automated performance measurement.
- The fourth article illustrates the capabilities and advantages of the Scenario-generation Tool Set developed by ARI. The tool set can be used to train platoon leader and company commander skills for current and future operational conditions, as well as provide a useful research tool to investigate key aspects of leader development and performance.

The results of ARI's training research and development program provide the methods, techniques, and tools to improve the employment of simulations, but more importantly it provides the scientific basis that is needed to inform the initial concepts and design of simulations so the technological potential achieves optimal training effectiveness.



Zita M. Simutis
Director and Chief Psychologist
of the United States Army

Symposium on PC-based Simulations and Gaming for Military Training

A number of PC-based games and simulations are currently being used as a means of training within the U.S. military, and that number is increasing. However, there is little coordination within or across services; and scarce research evidence on the effectiveness of these games and devices as training tools. Accordingly, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) hosted a symposium to bring personnel from all branches of the military together to discuss how games and game-like simulations are currently being used for training in the military and to identify ways that games could be used more effectively.

Participants included instructors/trainers from the Army, Navy, Air Force, and Marines, training developers, commercial simulation/game developers, training researchers, and representatives from the Office of the Secretary of Defense. Presentations explained the various training programs and developmental projects on simulations/games for military training and to promote discussion among the participants. All participants were asked to consider a set of five questions to discuss each of the presentations and to provide the information to summarize the "state of the practice" of using games and simulations for training. The following provides a summary of the information covered during the presentations and discussions, organized according to these five questions.

How are training games used effectively?

The majority of the participants agreed that training games can be used to train cognitive skills. To a lesser extent, the participants thought that they could also be used to demonstrate broad concepts. The overwhelming consensus was that for games to be effective, they needed to be integrated with good instructional techniques. The instructional techniques that were most frequently mentioned in the discussions were: providing timely feedback to trainees, establishing progressive goals, developing reliable outcome measures, providing realistic interfaces, and designing scenario flexibility into the game or device. In addition, the games used for training should be cognitively interesting and emotionally engaging for the trainees to improve motivation, promote continued use, and facilitate learning.

Games provide a way that instructors/trainers can overcome some of the resource constraints that they face (limited time, limited range access, individuals and units spread over great distances, high cost of ammo and repairs,etc.) This was considered a major benefit to game and simulation technologies.

Soldier training with simulation module

In addition, game-based simulations provide an effective way to augment and reinforce field exercises and schoolhouse training, and can be used as tools for continuous self development.

What interferes with training when using games?

A number of factors were sited as limiting or interfering with training:

- Unrealistic or inappropriate training scenarios
- Extraneous features that don't apply to the training and that distract from the training goals
- The inability to edit a scenario or to switch among a number of scenarios limits the capability to tailor the game to meet specific training needs or to update the game as missions or doctrine change
- Unwillingness or lack of "buy in" by supervisors, administrators, or trainers to try new techniques and use games and simulations in situations where they could be effective.

How can instructors/subject matter experts(SMEs) facilitate use of games?

Participants agreed that to use game and desktop simulation technologies successfully for training purposes, instructors and trainers required a high level of understanding of the

Continued on page 4

Symposium on PC-based Simulations and Gaming (continued)

Continued from page 3

subject matter, needed to actively channel student efforts towards the game, and needed to identify clear, explicit training objectives. In addition, they had to be able to provide clear and timely feedback to students about their performance during and after the game for training to be most effective.

How should game developers be supported to provide the most useful Army training tools?

Communication between SMEs, instructors, and game developers was considered essential for successful training. This communication must include the clear identification of training objectives and explicit guidelines on how the game will be used to train students (e.g., stand alone training vs. use as a training tool). This communication needs to be reciprocal and continuous over the development cycle and include a feedback cycle once the game is in use. In addition, to be an effective tool in Army training, performance measures or ways to assess that training has actually taken place are mandatory.

What are barriers to using games for Army training?

Several barriers to using games for Army training were identified by the participants of the workshop. Namely,

- Lack of a clear policy governing the use of games as part of military training programs
- No consistent guidance on how to use games for training purposes
- Fear that the use of games or desktop simulations will take the place of live field training and be seen as a way to reduce training budgets
- Reluctance of some DoD training officials to embrace new ways to meet the military's training requirements
- Vague training objectives and little scientific knowledge of the learning curves associated with playing a game or the factors that facilitate learning and reduce skill decay.

Questions Still Unanswered

In addition to the five questions summarized above, discussions covered a wide range of topics, and many questions on the use of games as a military training tool were left unanswered. The most often mentioned topic was funding; specifically, where will the funding come from to develop the needed games and simulation technologies? Another major topic was the lack of empirical research regarding the effectiveness of games as training tools, and the factors that can maximize their effectiveness. Additional issues included:

- What place will games have in the overall realm of training options
- What are the situational variables that indicate when a "training game" should be used to augment existing training
- What methods should be used to ensure that students with minimal computer gaming experience can benefit from the training as well as experienced "gamers"
- What metrics should be used to measure performance and to determine the extent of training that is actually taking place when using the game?

Summary and Conclusions

PC-based simulations and games do not train in isolation. Trainers train – games provide tools that help them accomplish their mission. At this point, games need to be used along with instructional guidance provided by trainers. To be most effective, trainers should know the game, and know how the game supports the military training objectives. Trainers can then coach and interact with the students to enhance the value of the game-based simulation. Training games definitely have a wide variety of potential applications in the military such as reinforcing initial entry training and providing practice, rehearsal, and refresher training. They could be used to train a vast spectrum of military skills and tasks on an "any time/anywhere" basis from flight simulations to periscope visual training to platoon leadership to medical procedures.

However, to realize their full potential they need to be treated as any other training device or delivery system.

Continued on page 5

Small Unit Training Simulation

Symposium on PC-based Simulations and Gaming (continued)

Continued from page 4

Sound, research-based instructional methodology must be used to establish clear learning objectives and training procedures that the game developers then use to design realistic scenarios to meet these learning objectives. To be most effective, game-engine-based simulations must provide feedback to the players by incorporating some form of automated feedback or AAR. In addition, human instructors should provide additional feedback to students to ensure that only correct military procedures and performance are reinforced. If students practice incorrect behaviors, it prolongs the training process and can have serious negative operational consequences if not corrected.

Almost everyone in attendance at the symposium emphasized the need for objective evaluation of the training effectiveness of any game or simulation. There was a wealth of anecdotal evidence to support the use of various games, but a dearth of empirical evidence. Research needs to identify where, when, and how training games can be used most effectively. In addition, research needs to address such issues as what skills, tactics, or techniques are best suited for training in game and simulated environments; what technology components within games and simulations facilitate learning and minimize skill decay; and what is the best mix of live, constructive, and virtual environments that help trainers make the best use of their resources to get the best training results. These are just a few of the issues that require further scientific investigation to leverage the full potential of PC-based simulations and games for military training.

Troops using PC technology for training.

An extensive listing of the military PC-based games and simulations already in use are located at the www.dodgamecommunity.com website.

A full report on this symposium, complete with list of attendees, presentation summaries, breakout group summaries, and conclusions is available through the ARI website, the Defense Technical Information Center (DTIC), or from Dr. Jim Belanich, ARI - Research and Advanced Concepts Office, ARI_ATMRU@ari.army.mil

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Dr. Zita M. Simutis, Director and Chief Psychologist of the U.S. Army

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Using Gaming Technology to Prepare Platoon Leaders for a Live- Fire Exercise

As described in the previous article, the Army is exploring various game technologies to help them accomplish their training mission. A primary reason for this is the current operational tempo and limited time and resources to train. This is especially problematic in the initial training of Army lieutenants attending the Infantry Officers Basic Course (IOBC) who may be deploying almost immediately following their training. For these lieutenants, platoon leader experience is critical. However, all are not currently given the opportunity to serve as platoon leaders during live-fire training exercises because of the limitations on time and resources.

To address this critical issue, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), and the Research Development and Engineering Command Simulation and Training Technology Center (STTC) is developing a training simulation, leveraging PC gaming technologies, that is designed to provide a simulated platoon leader experience. This training tool, the Rapid Decision Trainer (RDT), may help the Army provide a better training experience for all IOBC lieutenants in terms of directing platoon fires, be it in the field or in simulation. This article describes the RDT and the evaluation of this technology that is being done by ARI.

The Rapid Decision Trainer (RDT)

The main objective for the RDT is to prepare IOBC lieutenants for a platoon live-fire exercise. To meet this objective, the RDT provides each lieutenant with the opportunity to serve as platoon leader and execute simulated platoon-attack missions. The RDT allows them to conduct mission analysis and planning, and prepares them to make hasty decisions in response to the emerging conditions that occurred during simulated mission execution and those that would likely occur during a live-fire exercise following the RDT training.

The RDT simulates the terrain and battle conditions of the IOBC's live-fire exercise conducted at Fort Benning's Griswold Range. It presents lieutenants with a natural wooded environment in which a U.S. Army platoon leader commands a light Infantry platoon-attack operation. Blue force structures portrayed in the RDT simulate those available to a light Infantry platoon leader. The enemy force represented in the game is the kind of asymmetric force that might be encountered in a typical platoon-attack mission.

The RDT begins by presenting a company operations order to the lieutenant who, in turn, completes a platoon operations order. The command and control tasks of mission planning and analysis, task organization, and assignment of assets to squads are performed interactively using drop-down menu options. When the lieutenant completes the planning, actions can be initiated and observation and response to emerging threats that are portrayed on the simulated battlefield can begin.

The RDT automatically tracks and records performance data that describe the lieutenant's actions during the mission. Upon completion of the mission, the lieutenant is required to complete a knowledge quiz and a self-assessment performance checklist that consists of items relevant to successful mission execution.

Computer screen shot of Rapid Decision Trainer (RDT)

Evaluation of the RDT

Thirty-nine lieutenants enrolled in the IOBC participated in the ARI evaluation of the RDT. They were assigned to two types of training for evaluation purposes: large-group training and buddy-team training. Nineteen of the lieutenants were assigned to the large group training; 20 were assigned to the buddy-team training.

- For the large-group training, 7 of the 19 lieutenants were chosen randomly from the group to act as platoon leaders. Each conducted a successive portion of one mission while the remainder of the group observed, offered suggestions, and answered questions posed by a senior IOBC instructor.
- For the buddy-team training, one member of each of the 10 buddy teams acted as platoon leader and controlled a

Continued on page 7

Using Gaming Technology to Prepare Platoon Leaders (continued)

Continued from page 6

complete mission, while the other member of the team observed and offered suggestions on how to conduct the mission. Upon completion of the first mission, the members of the buddy-team switched roles and completed a second mission.

At the conclusion of the RDT training, all lieutenants received an after-action review from the instructor. A questionnaire administered to the lieutenants asked about their sense of personal involvement in the simulated missions, their perceptions of the value of the RDT for training, their motivations during training with the RDT, their perceptions of the realism portrayed, and adequacy of the RDT for platoon leader training.

Four days after the RDT training, all 39 lieutenants participated in a live-fire exercise at Griswold Range. Another questionnaire was administered immediately following the live-fire exercise and after-action review. Each lieutenant indicated their position in the platoon during the live-fire exercise and recorded their perceptions of how well the RDT simulated the live-fire exercise and how effectively the RDT prepared them to perform the platoon leader actions to complete a mission successfully.

Results of the Evaluation – Soldier Perceptions of the RDT

Regardless of which RDT training group the lieutenants were in, they endorsed the use of the game for the IOBC. They also indicated the following:

- the RDT had training value
- they felt immersed during simulated mission execution
- they were motivated to use the RDT to learn combat skills and practice making rapid decisions
- the overall fidelity or realism of the simulated battlefield events and actions in the RTD was adequate
- playing the game permitted them to complete many of the performance tasks that would enable them to successfully complete the platoon live-fire exercise.

However, there were some caveats in the ratings provided by those who trained with the RDT. These caveats included:

- a qualified instructor needed to be present to provide coaching, feedback, and an after-action review for the training to be most effective
- fun and personal entertainment were not considered to be important reasons to train with the RDT
- physical objects in the simulated environment could be improved
- computer-generated members of the platoon need to be more responsive and independent
- actions of the computer-generated enemy Soldiers need to be more challenging.

Implications of the Evaluation

Results from this evaluation have implications for future development of dismounted Infantry training games and simulations. One component of training games and simulations that has received considerable attention is the use of sophisticated graphics technologies. While these technologies can certainly increase the perceived realism of the simulated battlefield, it remains unclear how different types of graphics impact training effectiveness.

It is possible that a relatively low-fidelity simulation such as the RDT can have the same training impact as one with the latest, most expensive graphics built for the same training purpose. Results from our evaluation suggested that in spite of the RDT's relatively low level of realism, Soldiers perceived it as a valuable way to teach the skills for which it was developed.

The responses on the questionnaires that addressed motivations for training with the RDT indicated that lieutenants were more concerned about learning the skills that would help them to be better military leaders and perform well in the live-fire exercise than they were about having fun. All Army training is meant to be engaging. However, the relationship between fun and training effectiveness is not clear.

The RDT was developed for a very specific purpose and with a relatively limited scope (i.e., the RDT consists of only one platoon-attack scenario). Because of its design, the RDT is not overly complex, which makes it relatively easy to use. The evaluation indicates that it does a pretty good job of accomplishing the task of preparing lieutenants to get the most out of their live-fire platoon-leader experience, and is a step forward in helping the Army benefit from PC game technologies.

Simulation and game technologies provide possibilities for accomplishing military individual and unit training that can be safer, quicker, and cheaper. However, to fully realize these possibilities, the caveats indicated by the participants in this evaluation will need to be addressed in addition to the various research and development issues summarized in the previous article on the ARI Symposium on PC-based simulations and gaming.

For additional information, please contact Dr. Scott A. Beal, ARI - Infantry Forces Research Unit, ARI_IFRU@benning.army.mil

Electronic Training Support Packages (eTSPs) for the Future Force

The U.S. Army Future Force will be a lighter, more mobile, modular force that can readily operate within joint, interagency, and multinational environments. Units in this force will rapidly transition between missions, including warfighting and peacekeeping. In order to be prepared to respond rapidly across the full spectrum of operations, Future Force units will need the ability to train anytime, anywhere. This means that training will be increasingly delivered to Soldiers and units at a distance with equipment capable of supporting embedded training, including Future Combat Systems[1], laptop computers, small handheld devices, and collaborative internet sites. Teams (such as small groups of commanders and support personnel) within units that might be dispersed to various locations during an operation will be able to participate in simulation-based collective training exercises anywhere, anytime by accessing the command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) network from whatever means is available, whether deployed or at their home station. No matter how or where training is accessed, these collective exercises will require a training support package (TSP)[2].

Until now, TSPs have been a largely paper-based integrated set of manuals that contain all the products and materials needed to ensure that a training exercise or event is implemented as designed. Materials are included in TSPs for the training participants, observers, controllers, and leaders. To meet the needs of the future, the concept and design of a TSP must be almost entirely electronic rather than paper-based. Rather than an integrated package on an electronic shelf, TSPs will most likely consist of elements in databases that are pulled together as needed to support specific training requirements. For example, a unit leader will identify a training requirement and tasks that need to be practiced by a specific individual or group and request that the training support system or unit management system create or pull together materials needed to conduct a training exercise and deliver tailored materials electronically to all participants. In this way, future TSPs represent a very dynamic rather than static concept. These future TSPs have been referred to as electronic TSPs.

1 The concept for Future Combat Systems (FCS) is a system of systems that is fully networked to ensure rapid and complete sharing of information.

2 TSP is defined as a complete, exportable package integrating training products, materials, and information necessary to train one or more critical tasks (U.S. Army Training and Doctrine Command, 1999).

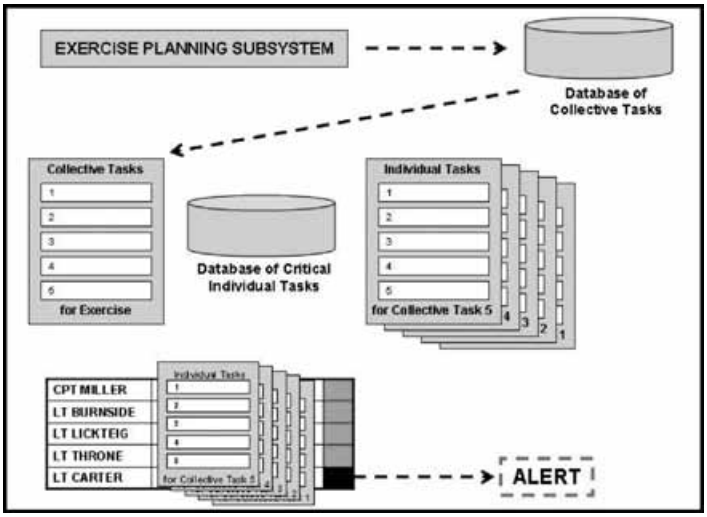
The ARI Armored Forces Research Unit at Fort Knox, KY has completed a research and development project addressing the future capabilities that should be included in eTSPs to conduct effective training. The project, entitled "Prototype Electronic Training Support Package for the Future Force," examined and demonstrated several capabilities that will need to be available in future embedded training and eTSPs. The project team reviewed numerous documents published by the U.S. Army Training and Doctrine Command (TRADOC) and the Unit of Action Maneuver Battle Laboratory (UAMBL) that outline the training requirements of the Future Force, as well as the training capabilities units would need to accomplish those requirements. The demonstration, produced as a compact disc (CD), focuses on five of the most critical capabilities of any electronic Training Support Package; each of these are discussed below.

Pretests and Selection Criteria

Pretests or specified entry criteria will allow the training support system to assess whether Soldiers and leaders have completed individual training requirements that are necessary for them to participate in collective training. The system will be able to screen the individuals who will participate in a collective exercise (see Figure 1) and then determine the qualifications of each participant and compare them to exercise participation requirements, referred to as gates. If a participant has not met the criteria for inclusion in a particular exercise, the commander has several options: inform and help the participant to meet the criteria before the scheduled exercise, select

Continued on page 9

Figure 1. Tasks as exercise selection criteria.



Electronic Training Support Packages (continued)

Continued from page 8

a different exercise, or override the system and let the participant be included without meeting the necessary criteria.

Rapid Exercise Modification

The capability to rapidly modify exercises is essential to provide a high level of realism and relevance to future training exercises and will allow commanders to tailor the training specifically to their unit's needs. To provide this capability, an exercise modification routine will be needed to identify, retrieve, modify, and update all of the relevant TSP elements requiring modification. The routine will be intelligent to the point that it will be able to carry out the desired modifications to the TSP throughout all required databases, and for those that need human intervention, it will provide step-by-step guidance and cues (i.e., electronic performance support). An overwatch element will also be required to make sure all changes are compatible and integrated with the rest of the exercise.

Missing Team Members

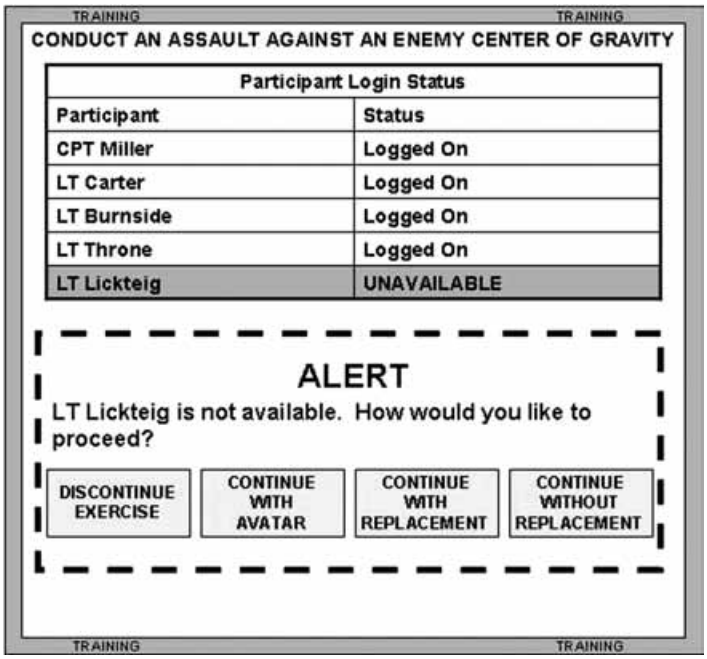
The exercise preparation subsystem will query all the participants and configure the training support system based on data retrieved from the eTSP. Using this query, if one of the participants is unavailable, the commander will have several options, including: discontinue the exercise, continue with a replacement for the missing team member, continue with a computer-generated replacement or avatar[3] for the missing team member, or continue with no replacement (this will exclude that team member's role entirely, and the training system would adjust the exercise accordingly). *(See Figure 2.)*

In the Future Force, leaders may have access to intelligent agents that can substitute for team members who are completing individual training or not available for other reasons. Leaders will be able to specify which participants in an exercise are actual team members and which are represented through intelligent semi-automated forces or other means[4], allowing training to be executed with any number of team members available.

3 In the near future, avatars will simulate missing team members in a limited manner, predominantly based on Objective OneSAF (semi-automated forces) capabilities.

4 The data for use by the avatar will be generated by routines that analyze the TSP components and generate the behaviors required to represent the missing team member based on exercise conditions.

Figure 2. Identification of team member unavailable for training.



Reach

Reach is defined as "the process by which military forces rapidly access information, receive support, and conduct collaboration and information sharing with other units unconstrained by geographic proximity, echelon, or command". Unit of Action Soldiers and leaders must be able to reach back through the C4ISR network to distributed repositories for a broad range of training and information products including: individual training, self-development courseware, maintenance training, terrain databases, troubleshooting lessons, and mission-related information. For example, a Soldier having difficulty meeting a particular performance requirement may drop out of a collective training exercise and reach through the network(s) to an institutional repository to complete remedial individual training before returning to the exercise.

The eTSPs will enable Soldiers and leaders to reach to central information repositories, subject matter experts (SMEs), or training developers for further assistance and training support. They can also reach to higher headquarters, adjacent units, the Home Station Operations Center (HSOC), or the TRADOC schools and centers. Access to joint resources will also be available.

Continued on page 10

Electronic Training Support Packages (continued)

Continued from page 9

Automated Performance Measurement

Automated performance measurement tools will provide performance assessment and feedback to facilitate after action reviews (AARs). The automated performance measurement tools will link performance data directly to training tasks and standards. The system will allow all participants to view performance data collected during the exercise. This will support detailed AAR discussions between participants, resulting in identification of strengths and weaknesses and leading to improved performance. The exercise evaluation subsystem will record the entire AAR, along with the performance data, and will save everything for future use.

These performance measurement tools will also provide the embedded training system with the capability to continuously monitor participant performance and identify instances of inadequate or poor performance by monitoring the actions of the participants and, using intelligent agents, comparing those actions to reasonable or expected actions. If a collective exercise participant is performing poorly, the commander will have several options for intervention, including: continuing the exercise while providing coaching, removing the participant from the exercise and providing tutoring while temporarily replacing the team member with an avatar, or pausing the exercise for everyone and conducting a short AAR.

Initially, these tools will be based on relatively straightforward performance measures, such as how long it takes a participant or unit to complete an activity or whether or not a specific activity occurred. In the future, as intelligent agents become more powerful and sophisticated, measurement will involve qualitative judgments that will not only include whether an action occurred, but also how well it was performed.

Conclusions

The demonstration of these capabilities has been provided to various agencies involved in Future Force training development, including the FCS Training Systems Integrated Product Team (IPT). After viewing the CD at their last meeting in March 2004, over 50 of the IPT members requested copies. The CD provides a detailed multimedia (video and graphic) presentation of how future eTSPs can provide the key training capabilities needed. Establishing an understanding of future capabilities is the first step in developing them.

For additional information or copies of the CD, please contact Dr. May Throne, ARI – Armored Forces Research Unit, ARI_AFRU@ari.army.mil

PC technology enables training on demand.

A Tool Set to Generate Scenarios for Training Research on Infantry Leader Skills

Simulation is not, by itself, training. Training comes when simulation is combined with scenarios that force practice of relevant tasks. (Defense Science Board, 2003)

Quality scenarios for training and for training research and development must systematically incorporate the details required to train leader skills, yet provide sufficient flexibility to accommodate the myriad conditions anticipated during military operations. The development of quality training scenarios for live simulations is a difficult and time consuming process, and even more complex for constructive and virtual simulations. Many more training options can be exercised in computer-based simulations where training can be conducted under almost any condition and at any location available to the simulation database. The process required to develop scenarios is further complicated because the factors that affect leader capabilities are changing rapidly as the Army transforms from the current force to the joint expeditionary force of the future.

Because of the time and effort required to develop good scenarios, simulation training often occurs under a restricted set of scenarios and scenario conditions. This undercuts a major objective of leader training, which is to develop adaptive leaders. The development of adaptive leader skills requires, by definition, exposure to multiple, complex scenarios that can be varied as missions and operations change. Equally troublesome from a research perspective is that each training research facility uses only the limited set of scenarios they have created or adopted, and they often differ in significant ways from the scenarios used by other research facilities. Since what is learned during training is dependent on the details built into the training scenarios, it is difficult, if not impossible, to compare training results from different research. Solutions are needed to: (1) develop methods to reduce the burden of building complex, effective training scenarios and (2) to promote standards for defining and varying critical scenario components used for training.

The work documented in this article describes a product, the Scenario-generation Tool Set, that ARI developed to further advance the Army's capability to evaluate, in simulated environments, the training and performance of Infantry small unit leaders, specifically platoon leaders and company commanders. The tool set provides the flexibility needed to adjust enemy and environmental conditions while employing the emerging Future Force doctrine, organizational structure, and equipment. The family of scenarios generated by the tool set places an Infantry small unit leader in a variety of exercise situations during training. The controlled variation in scenarios made possible by the tool set also provides the basis for analyzing leader preparedness, the impact of various technologies on leader performance, and the organizational and equipment tradeoffs in various situations.

Our Approach

The project began with an assessment of the challenges we would face in developing a set of scenarios that could be used for leaders of both a company and a platoon, and that would incorporate the flexibility to modify scenario parameters. Different constructs were identified for how modular scenario components might be structured to allow the desired flexibility. A search was conducted to identify alternative mission-related components and content that might be included in the scenarios. Web sites with military and terrain information were explored; doctrinal publications were reviewed; and the latest publications addressing the Future Force and the anticipated operating environment were examined. Military subject matter experts were consulted who were intimately familiar with lessons learned from recent U.S. military operations and with accepted military doctrine.

The model for the Scenario-generation Tool Set was an adaptation of the Scenario Oriented Recurring Evaluation System (SCORES) used by the U.S. Army Training and Doctrine Command during the "cold war" era. SCORES provided a framework to develop a series of scenarios to assess the combat performance and effectiveness of a military force. The SCORES scenarios also provided a means to precisely vary or tailor, in a controlled manner, selected aspects of the force associated with changes in Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF). ARI's scenario tool kit adapted SCORES to immerse small unit leaders in the threat model appropriate for the contemporary operating environment, rather than the cold-war, Former Soviet Union, model. It also allowed us to vary scenario components and content to support the training and analysis of leader decision-making performance rather than the evaluation of unit combat effectiveness.

Product Overview

Based on the determined requirements, materials for the scenario tool kit were selected, refined, or developed. The definable factors of the scenarios were drawn from the same six key factors that leaders currently use to visualize and assess

Continued on page 12

A Tool Set to Generate Scenarios *(continued)*

Multiple Factors Used to Generate Scenarios for Infantry Company Commanders and Platoon Leader

Mission		
Secure an airfield, disable equipment		Secure logistics site and materiel
Enemy		
Insurgent light infantry, primarily dismounted		Mechanized, more heavily armed infantry
Terrain		
Fort Benning		Fort Irwin
Weather/Season Data		
January		July
Troops and Support Available		
Current Force	Stryker Force	Future Force

Continued from page 11

the battlefield: Mission, Enemy, Terrain and weather, Troops and support available, Time available, and Civilian considerations (METT-TC). Different defined levels of the factors of mission, enemy, terrain, weather/season, and troops and support available became the basis for defining each of 48 fundamental scenario options for the company commander and 48 for the platoon leader, as shown in the table above.

First, we selected the Fort Benning and Fort Irwin terrains. This selection was determined more for the availability of data each provided to support mission planning and execution than for the locations themselves. For both locations, extremes in light and weather conditions were established using data available for mid-summer and mid-winter months.

The two types of missions shown in the table were defined through a series of operations orders. They were both offensive in nature and designed to take place behind the enemy's forward line of own troops, adding an increased element of risk. An airfield and a secluded logistics support base were selected as objectives because each was considered a high value site to capture intact rather than to destroy using long-range fires or air strikes. Additionally, each of these sites would have value to the enemy making it worth defending to prevent loss, or worth expeditious recapture, if lost. A light force and a mechanized force were selected as participants in the scenario to cover the two types of enemy situations.

To provide the variations required for analyzing the impact that unit organization and technologies have on leader performance, three organizational units were used to define friendly troops and support available. The base units include: (1) a current, light Infantry battalion configured without advanced technologies; (2) an interim unit based on a Stryker Brigade Combat Team that is supported by some digital messaging and situational awareness computer screens for leaders; and (3) a unit based on a future-force model that encompasses the modular force structure, organization, and equipment available through the Future Force Warrior and Future Combat System programs.

The base options illustrated in the table can be further modified to create more scenarios by injecting elements from a list of optional events or incidents developed to support mission execution and to stimulate leader supplemental orders and actions. For example, the scenario-generation process addresses factors related to the time available to complete the mission through optional events included in the operations order or programmed into the scenario. Other optional events and rules of engagement were developed to include civilian considerations that need to be made based on tactical situations being faced in recent operations. The list of optional incidents also provides other information, such as biographies of key personnel in the unit that can be injected into scenarios at the discretion of the trainer to vary the challenges for the leader and impact the flow of information in the scenario.

To supplement the scenario components (see figure on page 13), other materials were created to assist the users of the Scenario-generation Tool Set. These include

- Copies of electronic files of resource information to assist the users in preparing documents for leaders;
- Map boards with various overlays, as well as overhead imagery, to support the leaders during mission planning and execution;

Continued on page 13

A Tool Set to Generate Scenarios (continued)

Continued from page 12

- A User's Manual with a step-by-step "How to" guide for creating and customizing the scenarios to meet the needs of the user.

While military experience would be beneficial, the tool set can be used by someone with a basic understanding of military operations and the documents used by leaders to support their planning and execution of a mission.

Product Applications

The Scenario-generation Tool Set provides a repository of components for multiple applications. Further, the modular scenario components can be easily updated or modified based on information and lessons learned from training exercises and real-world operations; a distinct improvement from the static, one-time, one purpose use packages that are currently available.

The scenarios generated with the ARI-developed Tool Set can be used for training platoon leader and company commander skills required for current operational conditions. More importantly, the tool set can support training as the Army transitions to the joint expeditionary force of the future. Even before the actual future equipment and systems are fully developed, leaders can practice using system capabilities in an exercise environment to gain an appreciation for how the promised capabilities could be used successfully on the battlefield. This training can be accomplished in multiple situations to determine and evaluate the "what if" trade-offs of different employment options for the emerging capabilities.

In addition, the Scenario-generation Tool Set also provides a foundation to support current and future research efforts. Critical scenario components can be altered in a controlled manner to isolate and focus on key aspects of leader performance for analysis. For example, scenarios could be crafted that allow the researcher to isolate key factors affecting decision making under stress or to determine how leaders choose to interact with subordinates when they have various communication assets at their disposal.

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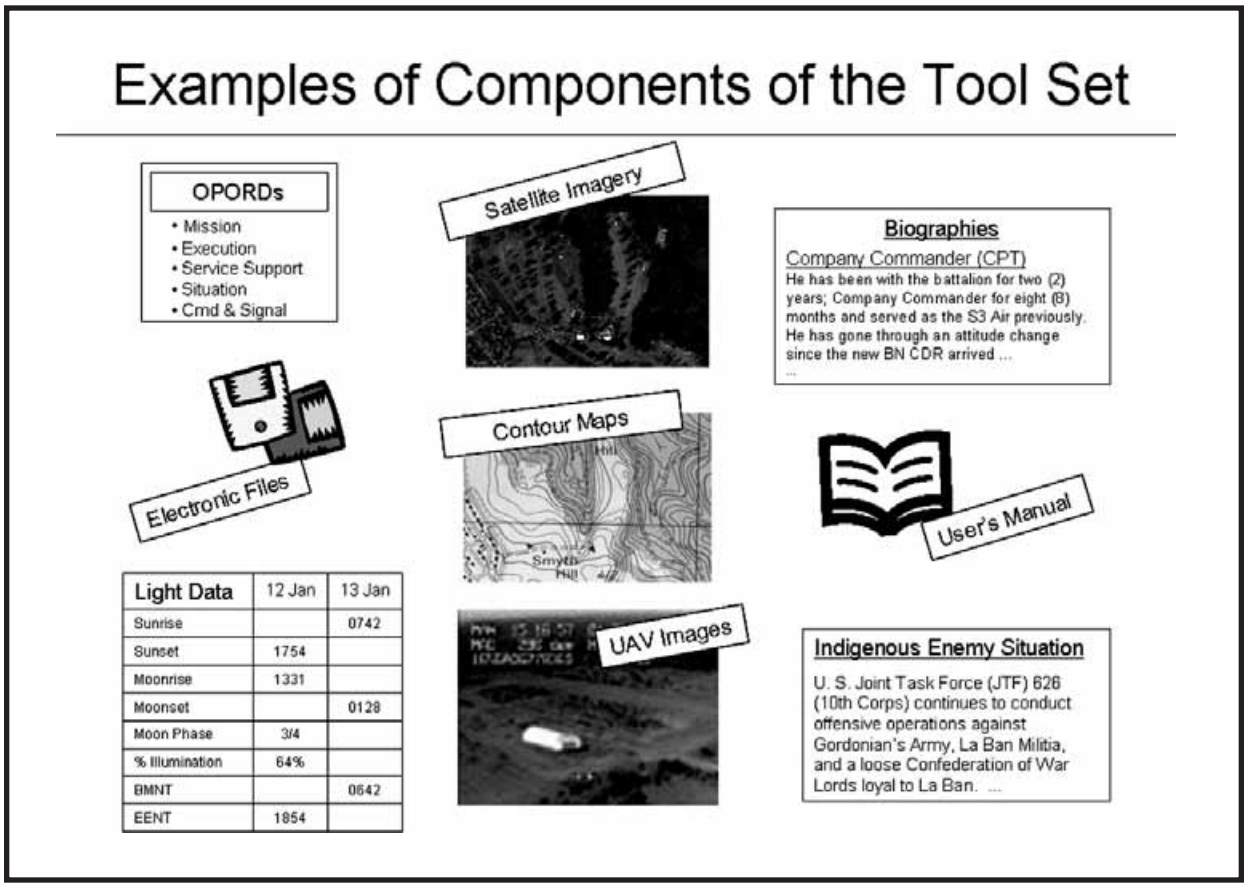

You're a Rifleman First

2004 Common Task Survey of the Army

In October 2004, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) launched the 2004 Common Task Survey of the Army for Active duty, National Guard and Reserve Soldiers. A highly efficient data collection procedure was established using Army Knowledge Online (AKO). By the beginning of January 2005, approximately 69,000 Soldiers from around the world, including Iraq and Afghanistan, had voluntarily completed surveys. Analysis will be on-going in the 3rd and 4th quarter of FY05.

Common tasks, plainly put, are a Soldiers' heart and soul. They are the basic skills and knowledge critical to every Soldiers' readiness to do battle regardless of their military occupational specialty. Such tasks as handling small arms and M16 rifles, performing combat first aid, conducting force security, land navigation, communications, staff battle command tasks and junior and senior leadership requirements. Army doctrine requires routine updates of officer, warrant officer and enlisted common tasks and the training and education required to teach these tasks spanning initial entry training, mid-level training, and senior level educational systems. Ideally, training is provided and qualifications verified in real time immediately proceeding required performance of the tasks. This reinforces learning and increases the chances of the highest proficiencies, that in turn, produces individual Soldiers with the maximum confidence in their abilities to accomplish their mission.

To enable development and delivery of training during a time of war that teaches the required tasks, skills and knowledge when needed, ARI was directed to conduct *The 2004 Common Task Survey of the Army* by the HQ Training and Doctrine Command (TRADOC), Deputy Chief of Staff for Operations and Training (DCSOPS&T) Directorate of Leader Development and Education and the Directorate of Training Development and Delivery in conjunction with key executive agents – the U.S. Army Combined Arms Center (USACAC), U.S. Army Warrant Officer Career Center (WOCC) and U.S. Army Sergeants Major Academy (USASMA). The mission of this survey is not a new one; however, during a time of war it is especially important to immediately collect and apply lessons learned from operational experience in terms of actual tasks that Soldiers and leaders are performing and the knowledge and skills required to perform these tasks. This Survey provides the mechanism to collect this information, realistically identify tasks, synchronize responsibilities, and quickly modify training and education to more realistically prepare Soldiers to perform their missions. Demographic and background items included in the survey help to analyze the various task performance and task training requirements at different levels of the Army and for different types of missions (e.g. Captain vs MSG vs CW3; OEF vs OIF, etc.)

For additional information, please contact Mr. Ronald Stump or William Badey, ARI Occupational Analysis Office, ARI_OAO@ari.army.mil

ARI Opens Two New Liaison Offices

With the increasing emphasis on joint operations and requirements, The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) entered into agreements with the Joint Forces Command (JFCOM) in Suffolk, Virginia, and the Joint Readiness Training Center (JRTC) at Fort Polk, Louisianna to establish offices for scientific coordination and liason.

At JFCOM, ARI placed Dr. Brooke Schaab, a research psychologist, with the Deputy Director of Joint Experimentation, J-9. Establishing this office provides a mutual benefit. For ARI, it keeps our finger on the pulse of joint issues as they unfold and provides input on the joint requirements for program development; for JFCOM, it provides timely, scientific expertise on-site to assist with planning and implementing experimentation and with developing tools to quickly and effectively assess combatant commander issues.

At JRTC, ARI has established an office for SGM (R) Bill Gates, former Sergeant Major of the Army, to work as a liaison to the Operations Group. Under the Operations Group Deputy Commander's supervision, he has established a Warrior Leadership Council.

This Council consists of representatives from each Operations Group Division, 1st Battalion (Airborne) 509th Infantry, the Center for Army Lessons Learned, the Soldier Support Center, and ARI. The primary purpose of the Council is to leverage JRTC's observer/controller expertise to identify and prioritize the critical small-unit leader deficiencies found across training rotations. The Council discusses these deficiencies and prioritizes training and leadership issues that are then fed into ARI's planning process for future investigation. In addition, SGM Gates has established a relationship with JRTC that allows ARI scientists to observe various rotations at the Training Center. This provides invaluable experience for our scientists who then bring this real-world experience back into their research and development projects.

SGM (r) Bill Gates welcomes Dr. Ken Evans (l) from the Infantry Forces Research Unit to the Joint Readiness Training Center (JRTC) at Fort Polk, Louisiana

Meeting of the JRTC Warrior Leadership Council


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